

Endovascular treatment of posterior nutcracker syndrome with a new autoexpandable stent



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ABSTRACT

The endovascular treatment of nutcracker syndrome is currently considered by some to be the preferred treatment option in this pathologic process despite its risks. However, currently, there are few data about the pure endovascular approach in the posterior nutcracker syndrome related to evolution in the midterm. We present two successful cases of a complete endovascular approach in this disease, with follow-up of 9 months and 17 months without complications. (*J Vasc Surg: Venous and Lym Dis* 2019;7:118-21.)

Keywords: Nutcracker; Posterior nutcracker; Retroaortic left renal vein; Venous stent; Pelvic venous insufficiency

Nutcracker syndrome (NS) is a well-defined pathologic process in which the therapeutic approach of first choice, although not globally accepted, is currently stenting of the left renal vein (LRV) with a self-expanding stent, which may be associated with left gonadal vein (LGV) embolization.^{1,2} However, the widespread use of stents for the treatment of this disease has led to infrequent but severe complications, such as stent migration to cardiac cavities.^{3,4}

The posterior NS (PNS), in which the LRV is retroaortic, has a higher level of complexity. Currently, most authors opt for either conservative management or classic surgical treatment.⁵⁻⁷ Little is known about endovascular treatment in PNS at present. It is not known whether the hemodynamic criteria of the renocaval gradient are applicable to this anatomic variant. There are no known complications associated with stent implantation between the aorta and the spine. In the medical literature, there are only two reports of PNS treated with a pure endovascular approach^{8,9} and one case treated with a novel hybrid technique.¹⁰ However, the clinical evolution of these cases in the midterm is also unknown.

We report two cases of PNS successfully treated with gonadal venous embolization plus angioplasty and retroaortic LRV stent implantation. In both cases, we have obtained complete clinical improvement. At present, at the 17-month follow-up of the first case and the

9-month follow-up of the second case, there have been no complications. Written consent was obtained from both patients, and they provided informed consent for this publication.

CASE REPORTS

Case one. A 44-year-old woman with a 2-year history of pain in the left flank and pelvic fossa, dyspareunia, and occasional macroscopic hematuria was referred to our angiology and vascular surgery department. A Doppler ultrasound examination showed left pelvic varicocele and a retroaortic LRV. Urinalysis was positive for microhematuria. On computed tomography angiography, we could observe in detail the severity of LRV compression between the lumbar spine and the aorta (Fig 1) and the dilation of the LGV with an ipsilateral varicocele.

Under general anesthesia, through the right common femoral vein, we catheterized the LRV. On renal phlebography, we could see a typical image of contrast material dispersion in multiple collaterals as well as the aortic imprint over the LRV (Fig 2, A). We registered a renocaval gradient of 4 mm Hg. The LGV was incompetent and developed a left pelvic varicocele (Fig 2, B).

We then proceeded with venous embolization of the LGV and the varicocele. We used three coils (Interlock-35; Boston Scientific, Marlborough, Mass) and 10 mL of polidocanol foam. After embolization, we proceeded to place a high support guide in the LRV, and we exchanged for a long and high support (Super Arrow-Flex, 11F, 65 cm; Teleflex, Wayne, Pa) sheath introducer in the infrarenal cava. At this time, we proceeded to systemic heparinization, which we usually do not perform in simple venous embolization.

We then carried out an angioplasty with an Atlas Gold (Bard Peripheral Vascular, Tempe, Ariz) balloon of 12 × 40 mm in diameter, inferior to the estimate of the LRV. This technique is usually done to assess the response of the vein to angioplasty.

After the pertinent measurements with 20% oversizing as we do by protocol in the treatment of NS, we implanted a 14- × 40-mm Venovo Venous Stent (Bard Peripheral Vascular) without incident. Control angiography showed correct positioning of the stent and direct flow to the vena cava (Fig 2, C).

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Fig 1. Computed tomography angiography of the first case of posterior nutcracker syndrome (PNS). The arrows indicate the point of maximum stenosis in the anteroposterior (A) and lateral (B) views of the retroaortic left renal vein (LRV).

In the immediate postoperative period, the patient had back pain at the dorsal lumbar level, which lasted for approximately 3 weeks with total posterior relief. At the 17-month follow-up, the patient was asymptomatic at all times, with only acetylsalicylic acid at low doses. Postoperative controls have not shown any complications, and the hematuria resolved.

Case two. A 38-year-old woman with a history of chronic pelvic pain on the left side, dyspareunia, and a significant varicocele was referred to our department of angiology and vascular surgery. On computed tomography angiography, we could confirm the varicocele and a retroaortic LRV. Analytical studies also showed microhematuria data.

Under general anesthesia, we proceeded with phlebography of the retroaortic LRV. It showed an atypical image, with a multitude of aberrant collaterals and an insufficient LGV associated

with the left varicocele. We measured a renocaval gradient of 2 mm Hg. Indirect signs of flow dispersion and aortic imprint were clear. We proceeded to catheterization of the LGV and its embolization with three Concerto (Medtronic, Santa Rosa, Calif) coils (two coils of 1.6 × 40 cm and one coil of 2 × 50 cm). After that, on phlebography, we verified the dispersion of the contrast material toward other collaterals, and the line of the aortic imprint became more marked (Fig 3, A). At this point, we decided to implant the stent, and we exchanged the short introducer for a high support one (Super Arrow-Flex, 11F, 65 cm) at infrarenal level. At this time, we proceeded to systemic heparinization and continued with the predilation of the LRV with an Atlas Gold balloon (14 × 40 mm), smaller than the diameter of the vein, as in the previous case, to better evaluate the response of the vein to angioplasty. Finally, we implanted a Venovo stent (18 × 40 mm) without incident (Fig 3, B).



Fig 2. Initial phlebography of the first case of posterior nutcracker syndrome (PNS) showing the aortic imprint (asterisk) over the retroaortic left renal vein (LRV; A) and left gonadal vein (LGV) insufficiency and varicocele (B). C, Final control of the renal vein stent and embolization of the gonadal vein.



Fig 3. Retroaortic left renal vein (LRV) phlebography after embolization. **A**, The aortic imprint is well marked (*asterisk*), with overgrowth of abnormal collaterals. **B**, Final control angiography after stenting of the renal vein and the embolized gonadal vein.

This patient, like the previous one, had significant pain in the back at lumbar level attributable to the contact of the stent on the spine. This pain completely disappeared in approximately 3 weeks. At present, during the 9-month follow-up, the patient is clinically well and asymptomatic. The medical treatment has been acetylsalicylic acid at low doses. She has not presented with more hematuria or any complications in the postoperative controls.

In both cases, the follow-up was exclusively with Doppler ultrasound because it is an accessible anatomic area, without finding any sign of complication (Fig 4).

DISCUSSION

To date, only two cases of complete endovascular treatment of PNS have been described. Our two cases are the first treated with a newly developed self-expanding stent (Venovo Venous Stent). These stents have good physical properties for a place in which fracture resistance plays an essential role. The follow-up of both cases is 17 months and 9 months, respectively. We show with these cases

that the pure endovascular approach for PNS is safe and similar to that for NS, in which the LRV has a normal anatomic position.

It seems clear that clinically, the NS and the PNS are indistinguishable and the technique for their treatment is similar, but some aspects are different. It is unknown whether the renocaval gradient is equally applicable in these values for the PNS. If intraoperative control with intravascular ultrasound is not used, as it is in our cases so far for logistical reasons, it is necessary to check indirect signs of compression as the aortic imprint in the LRV and the overgrowth collaterals. The postoperative back pain in the early postoperative period is due to the pressure of the self-expanding stent on the spine.

CONCLUSIONS

In patients with PNS, endovascular treatment by gonadal venous embolization and stent implantation in the retroaortic renal vein, a priori, does not have significant differences in relation to the endovascular approach

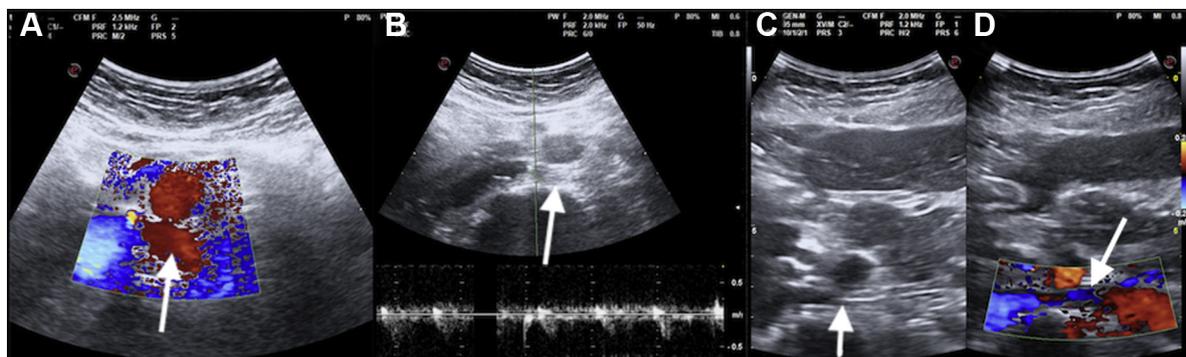


Fig 4. Doppler ultrasound images of the first case (**A** and **B**), with 17 months of follow-up, and of the second case (**C** and **D**), with 9 months of follow-up. Patency of both stents (*arrows*) is shown.

for the NS from a technical point of view. We can affirm that in a medium-term follow-up, the treatment of PNS does not seem to be inferior in safety or efficacy to that of NS.

REFERENCES

1. Chen S, Zhang H, Shi H, Tian L, Jin W, Li M. Endovascular stenting for treatment of nutcracker syndrome: report of 61 cases with long-term followup. *J Urol* 2011;186:570-5.
2. Wang X, Zhang Y, Li C, Zhang H. Results of endovascular treatment for patients with nutcracker syndrome. *J Vasc Surg* 2012;56:142-8.
3. Sebastian T, Erdoes G, Bratu VA, Baumgartner I, Kucher N. Endovascular extraction of a migrated large self-expanding laser-cut renal venous stent from the right ventricle. *J Vasc Surg Cases Innov Tech* 2017;3:79-82.
4. Wu Z, Zheng X, He Y, Fang X, Li D, Tian L, et al. Stent migration after endovascular stenting in patients with nutcracker syndrome. *J Vasc Surg Venous Lymphat Disord* 2016;4:193-9.
5. Zhang X, Wang S, Wei J. Prosthetic left renocaval bypass for posterior nutcracker syndrome. *Indian J Surg* 2015;77(Suppl 1):103-5.
6. Li X, Ji C, Guo H. Abdominal aortic transposition as a treatment alternative for posterior nutcracker syndrome. *Int J Urol* 2012;19:1043-4.
7. Marone EM, Psacharopulo D, Kahlberg A, Coppi G, Chiesa R. Surgical treatment of posterior nutcracker syndrome. *J Vasc Surg* 2011;54:844-7.
8. Allam SR, Livingston TS, Kalaria V, Diaz-Calderon W, Pumphrey JA, Patel L, et al. Posterior nutcracker syndrome: an infrequent cause of hematuria. *Kidney Int* 2014;85:985-6.
9. Granata A, Clementi A, Floccari F, Di Lullo L, Basile A. An unusual case of posterior nutcracker syndrome. *Clin Exp Nephrol* 2014;18:670-1.
10. Stawiarski K, Wosnitzer M, Erben Y. A novel hybrid left renal vein transposition and endovascular stenting technique for the treatment of posterior nutcracker syndrome. *J Vasc Surg Cases Innov Tech* 2017;3:142-5.

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